DMT
DANISH MYO TECHNOLOGY

STIMULATOR CS4/CS8 & MyoPULSE SOFTWARE

USER MANUAL

User Manual

Version 1.0

TRADEMARKS

Danish Myo Technology A/S reserves the right to alter specifications as required.
This document was, as far as possible, accurate at the time of producing.
Changes may have been made to the software and hardware it describes since then.
New information may be supplied separately.

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*** WARNING ***

THIS STIMULATOR IS NOT APPROVED FOR USE ON HUMAN SUBJECTS.

CAUTION: RISK OF ELECTRIC SHOCK.

SAFE OPERATING PROCEDURES AND PROPER USE OF THE EQUIPMENT ARE THE USER'S RESPONSIBILITY.

Danish Myo Technology A/S provides information on how to use this stimulator, but Danish Myo Technology A/S is not responsible for the after-sale operation and safety practices. This is a matter for the user when working with the stimulator.

ALL PERSONNEL WHO WORK WITH OR ARE EXPOSED TO THIS EQUIPMENT MUST TAKE PRECAUTIONS TO PROTECT THEM SELVES AGAINST POSSIBLE SERIOUS INJURY.

1. Do not remove the input or output cables while the stimulator is active (output switch ON). Never short-circuit the high voltage output of the stimulator. It can result in potential risk of electric shock to the user, and damage the system.

2. Pulsed power systems are capable of random triggering via transients or ESD. Therefore when the stimulator output switch is turned ON, assume it is possible to get a pulse on the output connector.

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CHAPTER 1 - SYSTEM OVERVIEW

1.1 Stimulator CS4

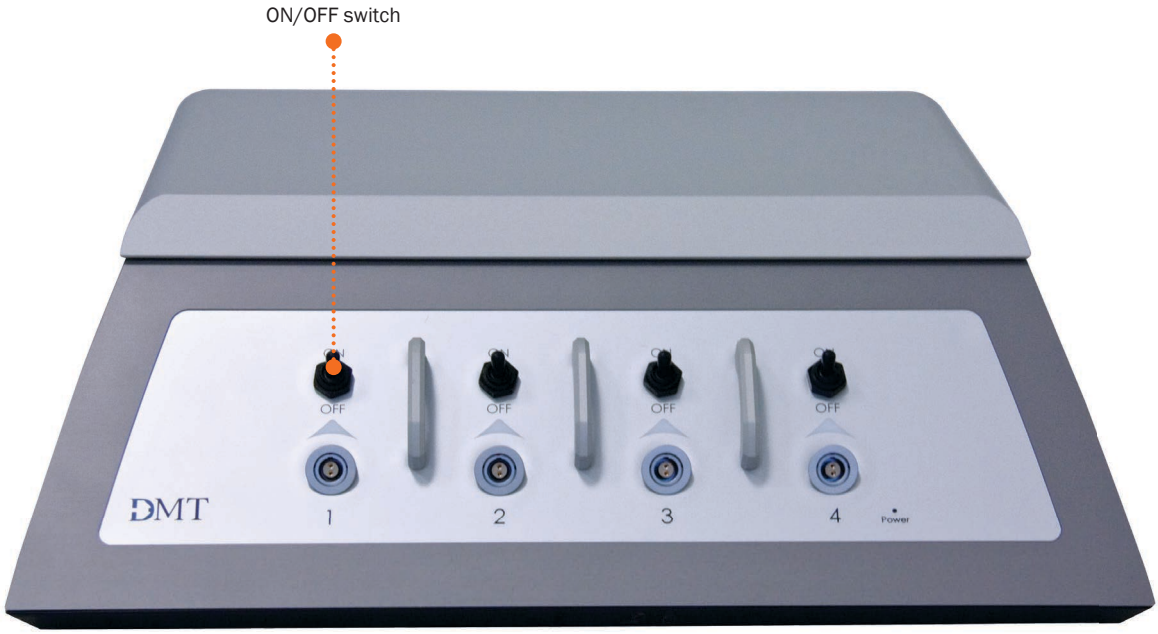


Figure 1.1 *Stimulator CS4 - front panel*

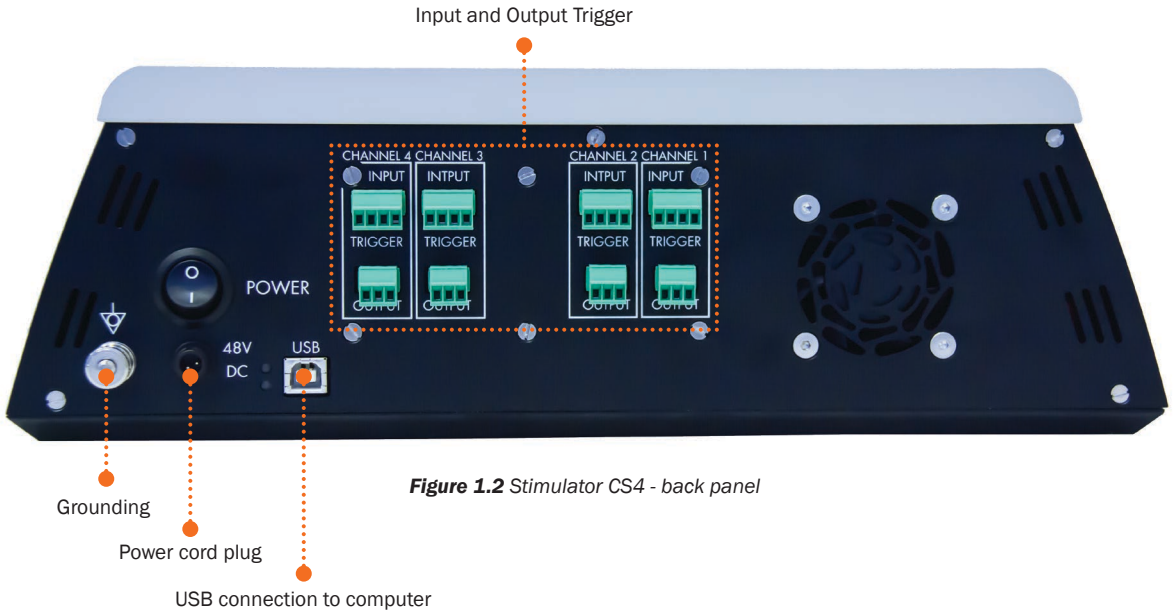


Figure 1.2 *Stimulator CS4 - back panel*

1.2 Stimulator CS8

Figure 1.3 *Stimulator CS8 - front panel*

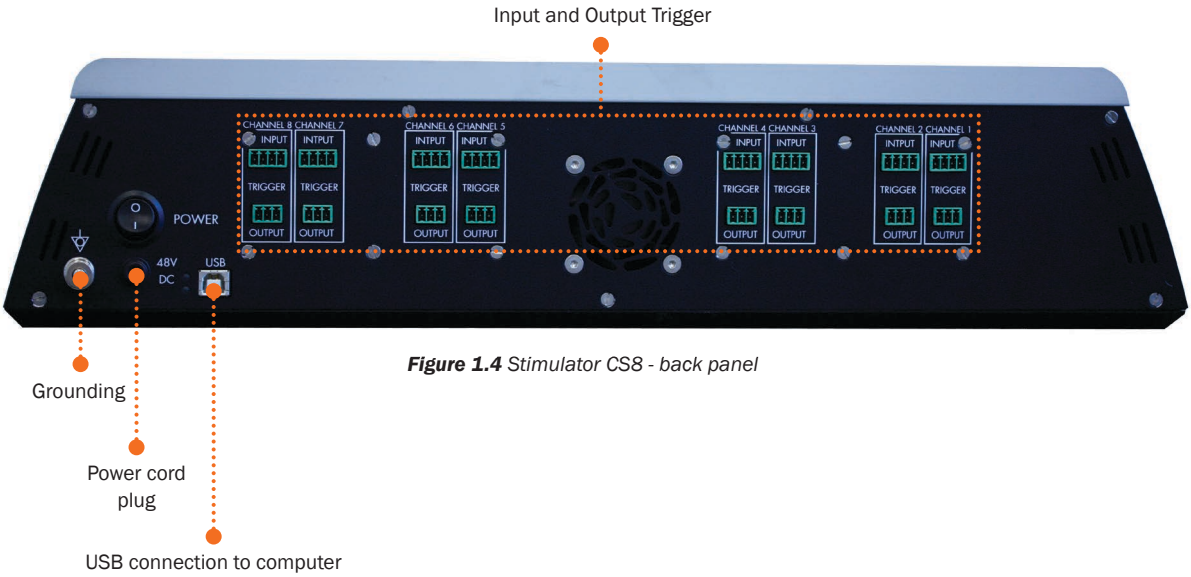


Figure 1.4 *Stimulator CS8 - back panel*

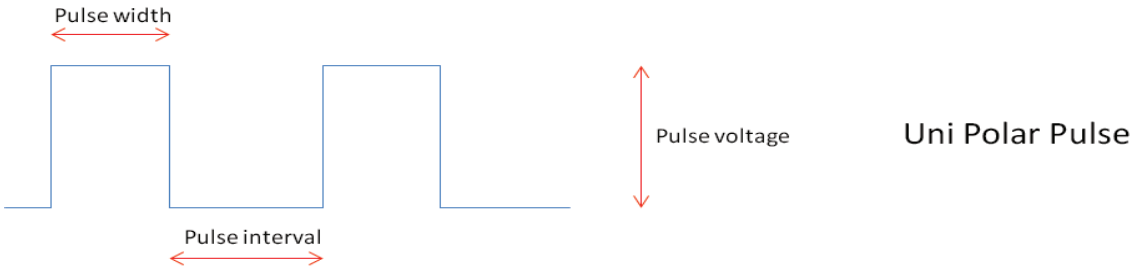
1.3 Setting up step-by-step

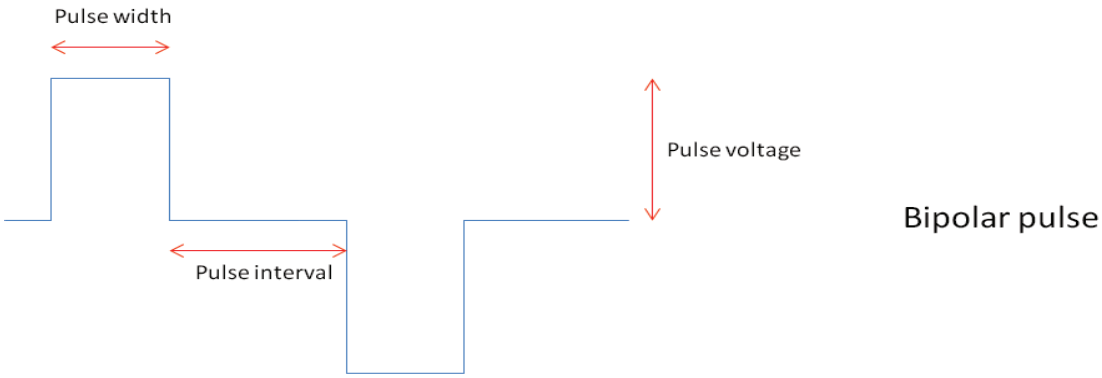
1. Connect the supplied 48V power converter to the Stimulator.
2. Connect the Stimulator to the computer with the supplied USB cable.
3. Follow the supplied Quick Installation Guide for MyoPULSE.
4. Start the MyoPULSE Software on the computer (see chapter 2).

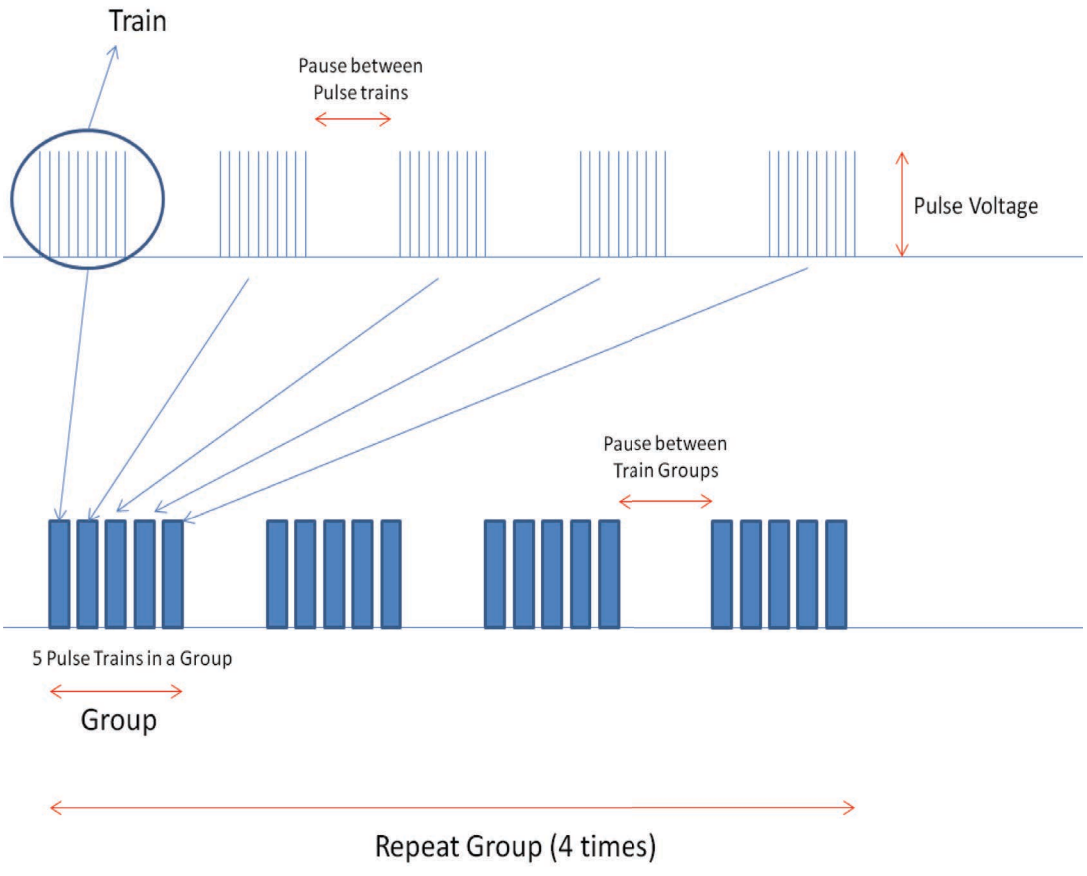
1.4 Definitions within MyoPULSE

The CS4 and CS8 Stimulator can only be operated using the MyoPULSE Software. The function of the MyoPULSE Software is to set all the pulse parameters and load this to the CS4 and CS8 Stimulators.

Definitions within MyoPULSE:







CHAPTER 2 - MYOPULSE SOFTWARE

2.1 MyoPULSE Start up on computer

Go to Start > All Programs > DMT > MyoPULSE

NOTE
RIGHT CLICK ON MYOPULSE SOFTWARE AND SELECT "SEND TO" TO CREATE A MYOPULSE SHORTCUT ON YOUR DESKTOP.

As long as the Stimulators has not been off power MyoPULSE will start up with the stimulation protocol used last time MyoPULSE was used.

The following MyoPULSE screen will now be visible on the screen:

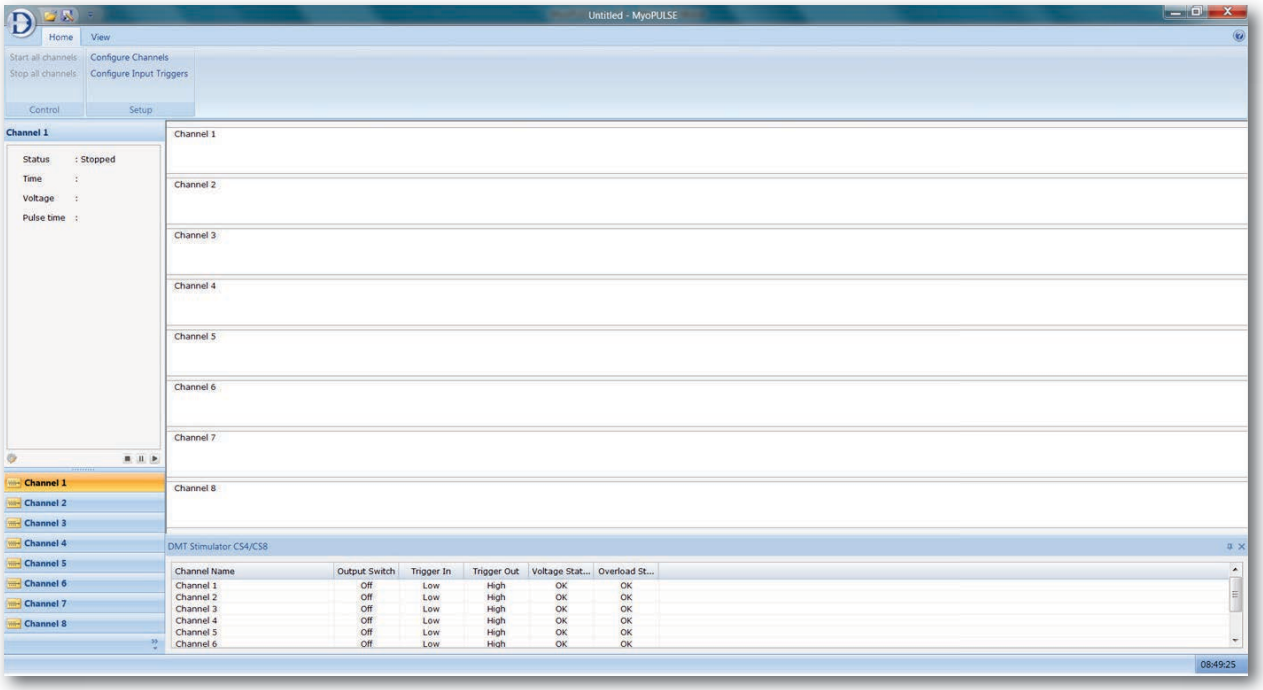


Figure 2.1 *Example of MyoPULSE start screen*

2.2 Main menus

In the top left corner the MyoPULSE main menus can be seen. The main menus includes **Home menu** and **View menu**.

2.2.1 Home menu

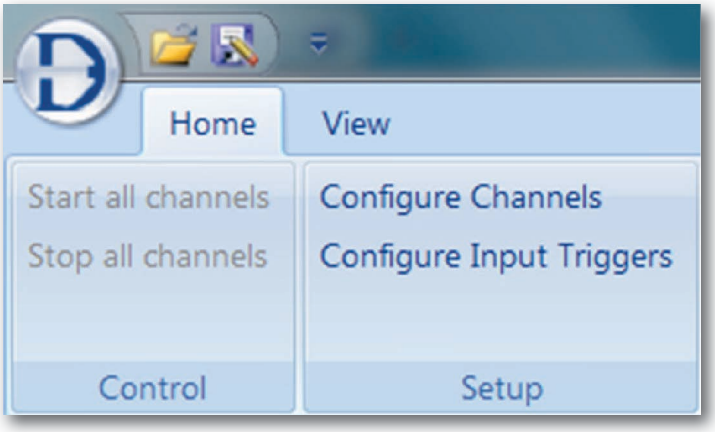


Figure 2.2 *Home menu*

The **Home menu** has two sub menus: **Control** and **Setup**.

The **Control sub menu** is used to start or stop a user defined stimulation protocol on the CS4 and CS8 Stimulator on all channels simultanously by clicking on either **Start all channels** or **Stop all channels**, respectively.

The **Setup sub menu** has two functions, the **Configure Channels** and the **Configure Input Triggers**.

The **Configure Channels** is used to define a stimulation protocol on all eight channels by clicking **Configure Channels**. How to define a stimulation protocol using the **Configure Channels** is described in chapter 3.1.

The **Configure Input Trigger** is used to define external Input Triggers from a connected system as e.g. a MyoDynamics Muscle Strip Myograph System - 840MD or a Powerlab data acquisition system. The external Trigger Input is used to define when a stimulation protocol should start on the CS4 or CS8 Stimulator. The configuration of the Input Trigger is described in chapter 3.5.

2.2.2 View menu

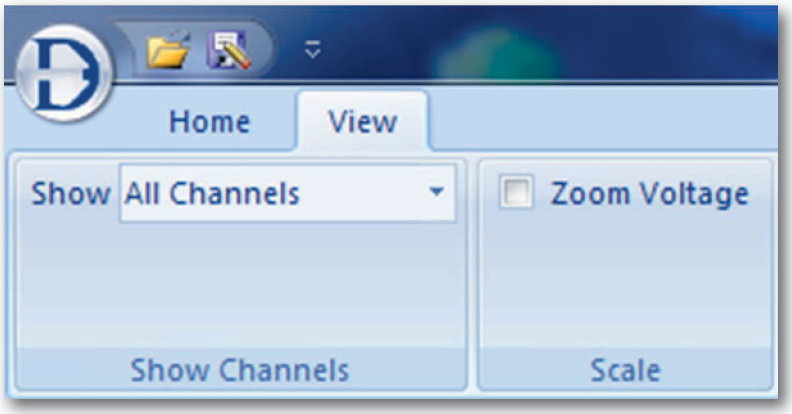


Figure 2.3 *View menu*

The **View menu** contain the **Show Channels sub menu** which is used to select which channels should be shown in the graphic view. By Selecting **All channels** a graphich view of the stimulation protocols for all eight channels will be shown (see figure 2.4).

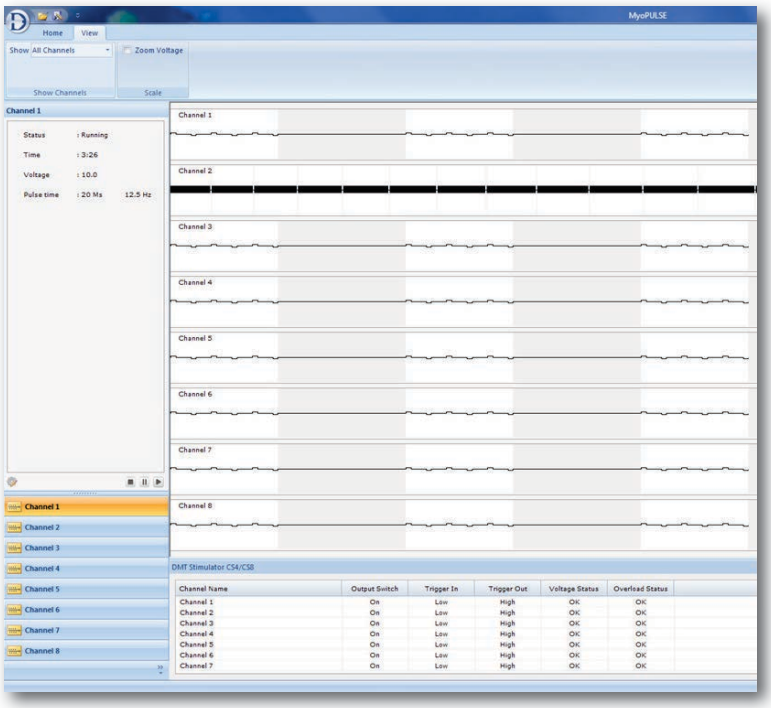


Figure 2.4 *Graphich view of the stimulation protocols for all eight channels*

The **Scale sub menu** is used to zoom in on the graphic display of a defined stimulation protocol. By clicking on the **Zoom Voltage** the graphic display of a defined stimulation protocol will scale the y-axis (voltage) to cover the whole y-axis scale. After clicking the **Zoom Voltage** the graphic view of the stimulation protocol is scaled to maximum on the y-axis as shown in figure 2.5 below.

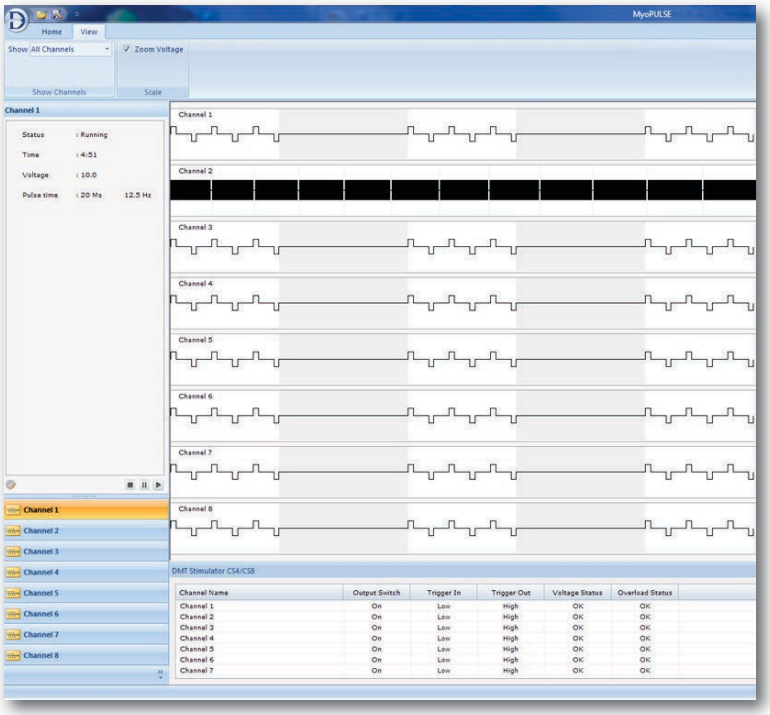


Figure 2.5 *Graphic view of the stimulation protocol scaled to maximum on the y-axis*

CHAPTER 3 - MYOPULSE CONFIGURATION

3.1 Configure Channels – Stimulation protocol

In MyoPULSE there is two different ways of configuring the channels and making a stimulation protocol:

1. Configure all four/eight channels with the same stimulation protocol.
2. Configure a single channel with a stimulation protocol.

3.1.1 Configuration of all four/eight channels with same stimulation protocol

Go to the **Home menu**, click on the **Configure Channels** and the stimulation protocol guide will start up (see chapter 3.2). The protocol will automatically be loaded into all channels of the stimulator when the stimulation protocol guide is finished. After the stimulation protocol have been made save the protocol.

3.1.2 Configuration or change of the stimulation protocol on one specific channel

Right click on the given channel e.g. Channel 1 in the lower left panel of MyoPULSE. The following window will appear on the screen with following five menu points:

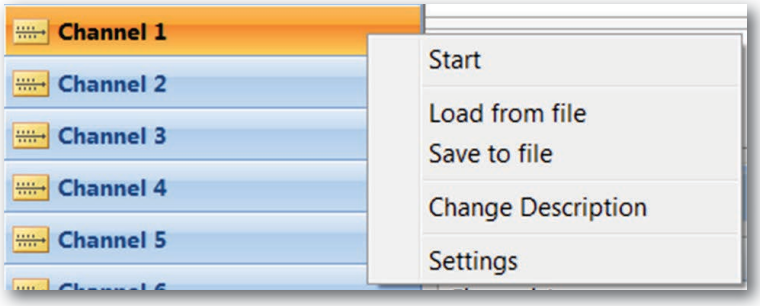


Figure 3.1 *Configure a single channel*

Description of the menu points when right clicking on a single channel:

Start: Will start the stimulation protocol entered for channel 1.
Load from file: Load an existing single channel stimulation protocol in the given channel.
Save to file: Save the stimulation protocol in the given channel to a file.
Change Description: The name or description (short) of the given protocol.
Settings: Starting up the stimulation protocol guide creating a protocol for the given channel and **ONLY** this channel. After the stimulation protocol have been made using the stimulation protocol guide remember to save the protocol in a file by clicking **Save to file**.

Go to the **Settings menu** and the stimulation protocol guide will start up (see chapter 3.2). The stimulation protocol guide will create a protocol for the given channel and **ONLY** this channel.

It is important to enter a description of the protocol in **Change Description** to be able to see the name of the stimulation protocol loaded into each channel. For example if Channel 1 is running a different protocol than the other channels then go into **Change Description** and enter a description/name as shown in figure 3.2 below and save it.

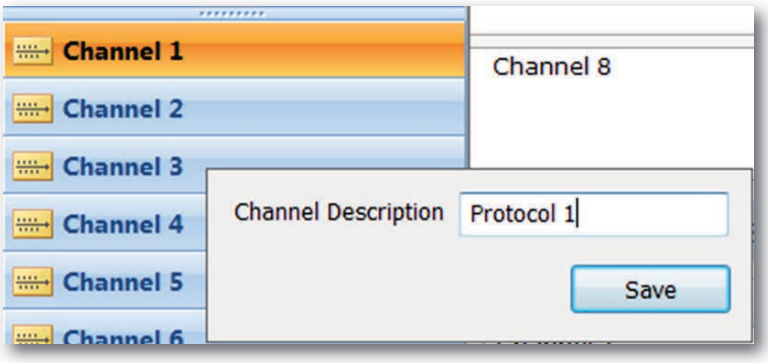


Figure 3.2 *Channel Description*

The description/name of the protocol will be shown in the **Channnel Name column** in the lower panel of MyoPULSE showing the CS4/CS8 Stimulator status as shown in figure 3.3 below (orange circle).

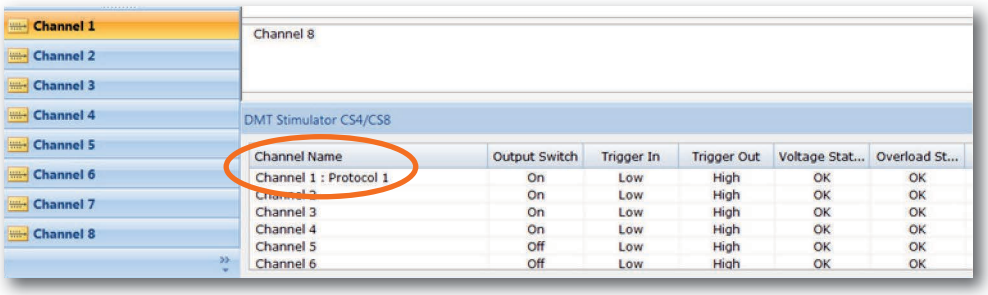


Figure 3.3 *CS4/CS8 Stimulator status*

3.2 Stimulation Protocol Guide

Go to the **Home menu** and click on the **Configure Channels** to make the same stimulation protocol for all 4/8 channels or right click on a given channel and click **Settings**, to make a stimulation protocol for a single specific channel. The following window will appear on the screen, see figure 3.4 below.

There is three different stimulation protocol types in MyoPULSE (see definitions within MyoPULSE in chapter 1.4):

1. Single pulse
2. Continuing pulse
3. Train pulse

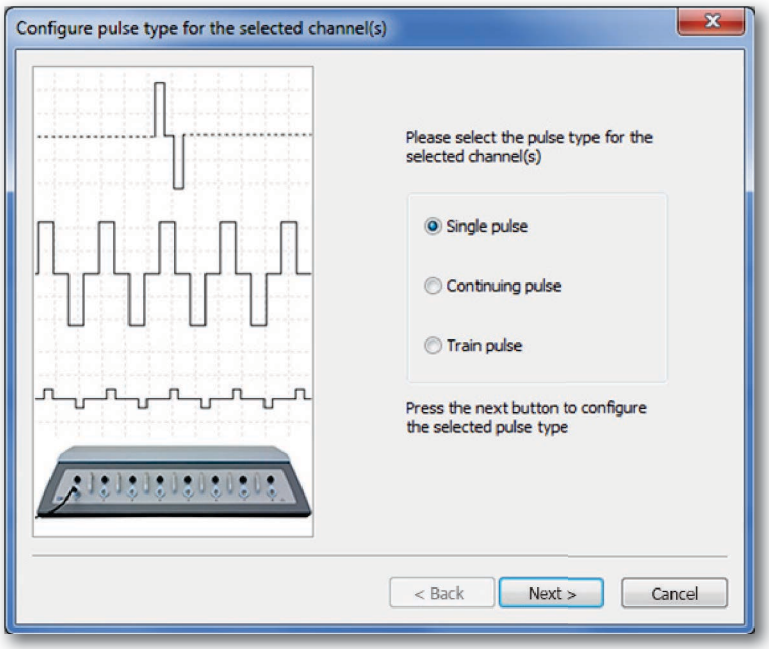


Figure 3.4 *Stimulation Protocol Guide - configure pulse type*

3.2.1 Single Pulse stimulation protocol

In the Single Pulse stimulation protocol the **Pulse shape** can be set to:

- **Bipolar:** First single stimulus will be positive and MyoPULSE will remember that the next Single pulse if repeated will be a negative voltage pulse.
- **Positive Monopolar:** Single positive voltage pulse.
- **Negative Monopolar:** Single negative voltage pulse.

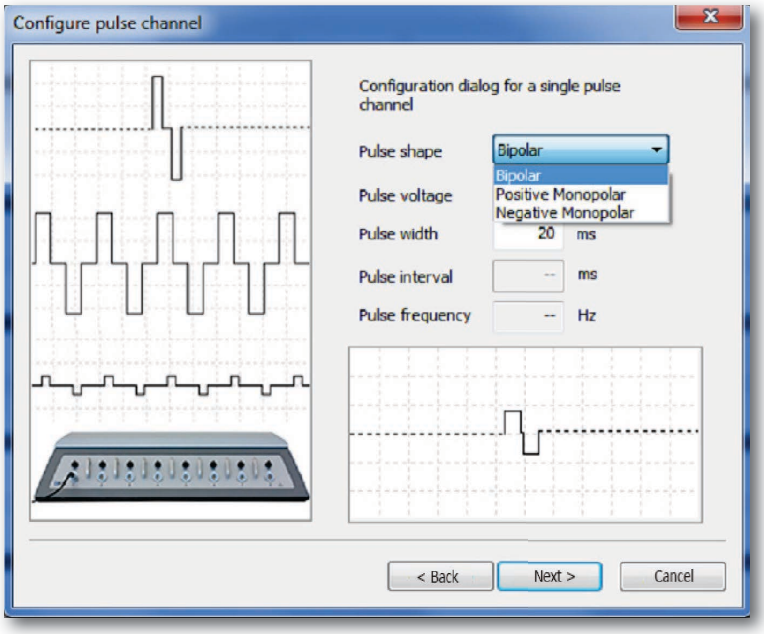


Figure 3.5 *Single Pulse stimulation protocol - Pulse shape*

Next set the **Pulse voltage** of the single pulse. In MyoPULSE the voltage can be set between 0-31 volt depending on the Pulse width. In the following scheme the maximum voltage that can be entered is listed for different Pulse width times.

Max Pulse Voltage (volt)	Pulse width time (msec)	Max Volt/cm (840MD/820MS)
24	10-25msec	30
28	5-10msec	35
30	1-5msec	37.5
31	0.1-1msec	41.5

Scheme 3.1 *The scheme show the maximum Pulse Voltage possible to enter for different ranges of Pulse Widths.*

In the Max Volt/cm column the maximum volt/cm is shown for NFS coverlids for the Muscle Strip Myograph System - 820MS and MyoDynamics Muscle Strip Myograph System - 840MD (electrode distance is 0.8cm)

Next setting is the **Pulse width** in milliseconds (0.1msec - 25msec). In the Single Pulse mode the **Pulse Interval** and the **Pulse frequency** are irrelevant and therefore inactive. After defining the **Pulse voltage** and **Pulse width** click **Next**.

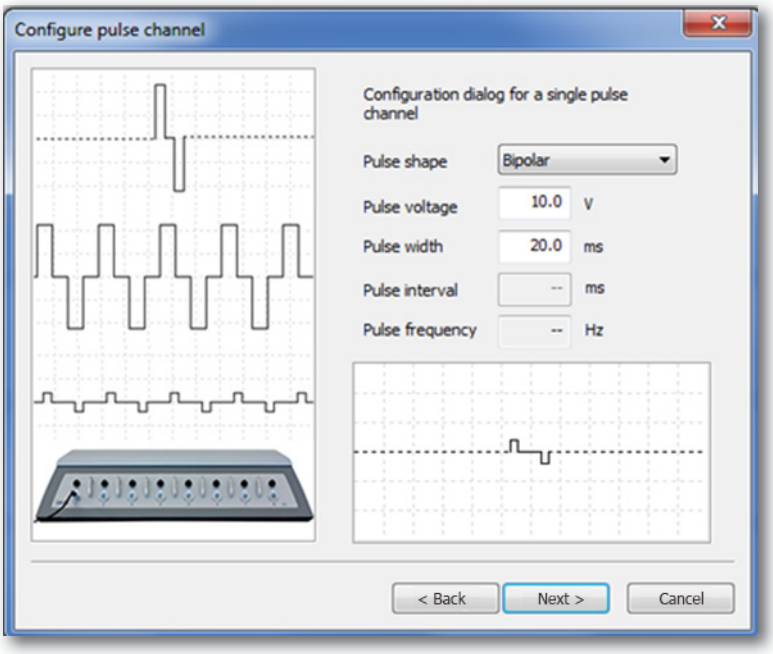


Figure 3.6 *Single Pulse stimulation protocol - Pulse voltage and width*

The next window is the **Digital Input and Output** settings.

The **Digital Input Settings** is used to define when the stimulator should start the stimulation protocol. In MyoPULSE there is four different settings possible for starting the stimulation protocol.

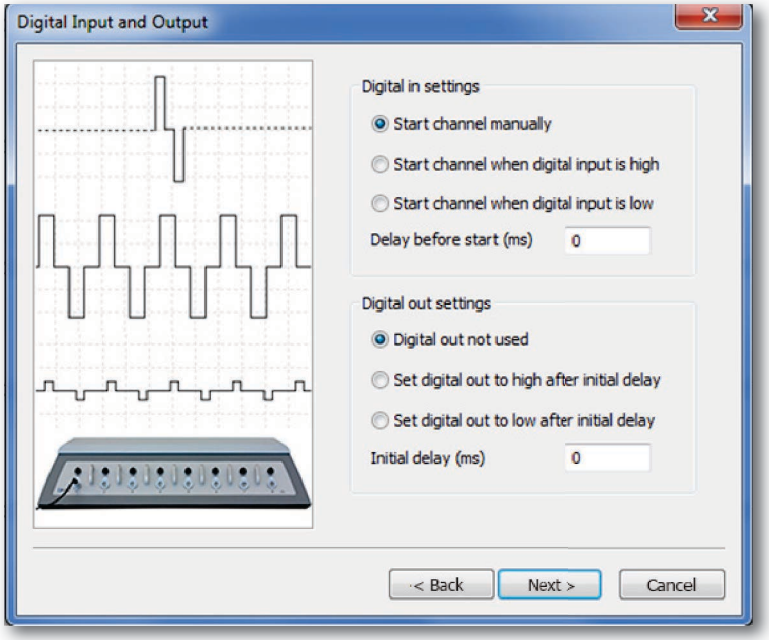


Figure 3.7 *Single Pulse stimulation protocol - Digital Input and Output*

1. **Start channel manually** – Use **Start all channels** in the **Control sub menu** in the **Home menu**. Alternative a specific channel can be started by clicking on the channel to highlight it.

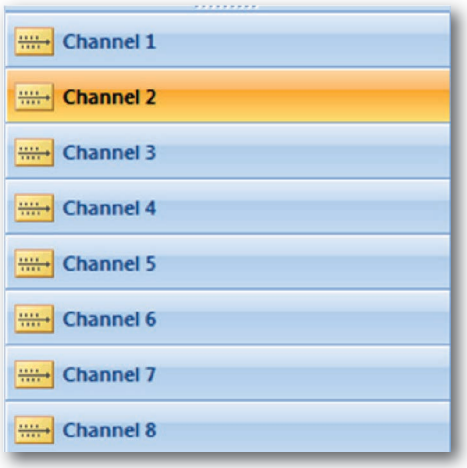


Figure 3.8 *Highlighted channel*

Then click the **Play Button** in the Channel status window shown in figure 3.9 below.

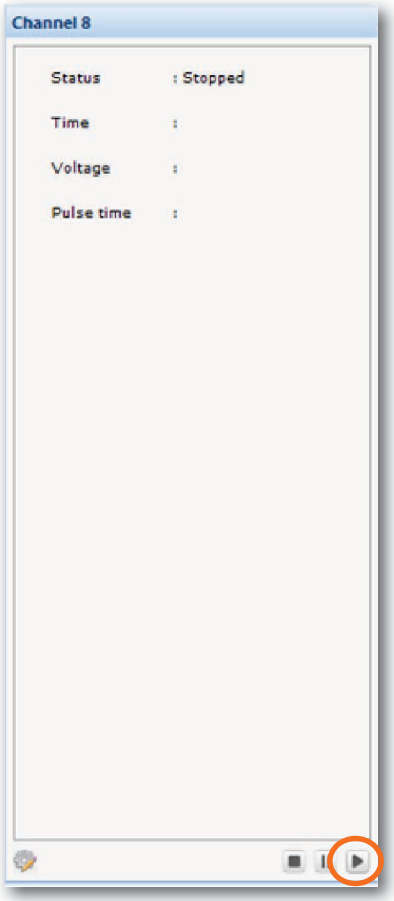


Figure 3.9 *Channel status window*

2. **Start when Digital input is high** - The CS4 and CS8 stimulator will not start the stimulation protocol before a high voltage trigger input is received (between 6 and 24 volts).

3. **Start when Digital input is low** - The CS8 stimulator will not start the stimulation protocol before a low voltage trigger input is received (0 volts).

4. **Delay before start** - Enter the delay in milliseconds wanted before the stimulation protocol should start after the trigger was received.

The Digital Output Setting is used to send a trigger signal to an external unit e.g. the MyoDynamics Muscle Strip Myograph System - 840MD to trigger the start of the motors. In MyoPULSE there is four options available:

1. **Digital output not used** – No trigger will be send.

2. **Set digital output to high after initial delay** – A high volt trigger will be send (6-24 volts) (used for the MyoDynamics Muscle Strip Myograph System - 840MD).

3. **Set digital output to low after initial delay** - A low volt trigger will be send (0 volts).

4. **Initial delay (ms)** – Enter the delay in milliseconds wanted before the trigger should be send. If a Digital Output trigger is chosen with a delay then enter the delay of interest in the Initial delay field in milliseconds.

After the setting of the Digital Input and Output press **Next**.

The last window in the Single Pulse configuration is showing the settings selected by the user as a summary (see figure 3.10 below) showing the:

- Pulse Type
- Pulse shape
- Pulse width
- Pulse Interval
- Frequency (calculated)
- Voltage
- Total running time (calculated)

Click **Finish** to save the stimulation protocol and transfer the protocol to the stimulator.

NOTE
IT IS VERY IMPORTANT THAT YOU CLICK ON THE FINISH BUTTON OTHERWISE THE PROTOCOL WILL NOT BE TRANSFERRED TO THE STIMULATOR.

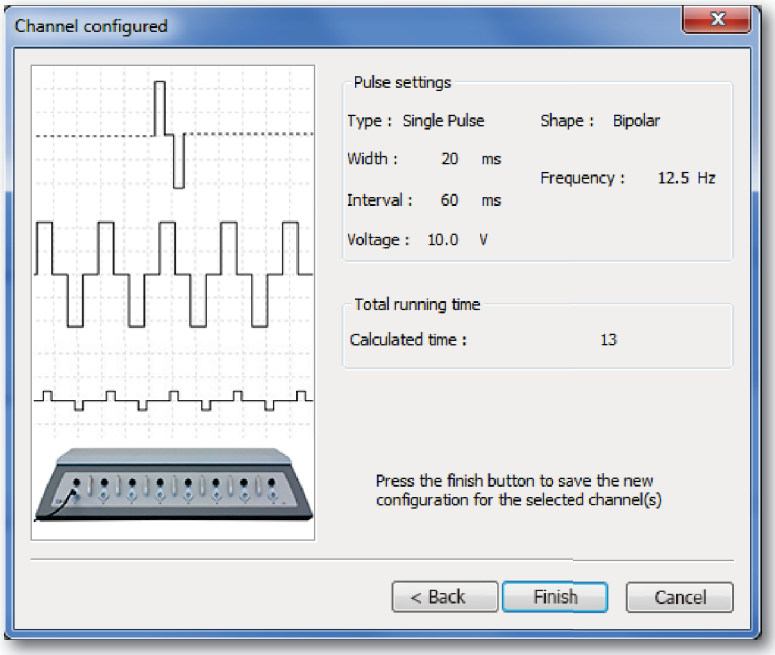


Figure 3.10 *Single pulse stimulation protocol summary*

3.2.2 Continuing Pulse stimulation protocol

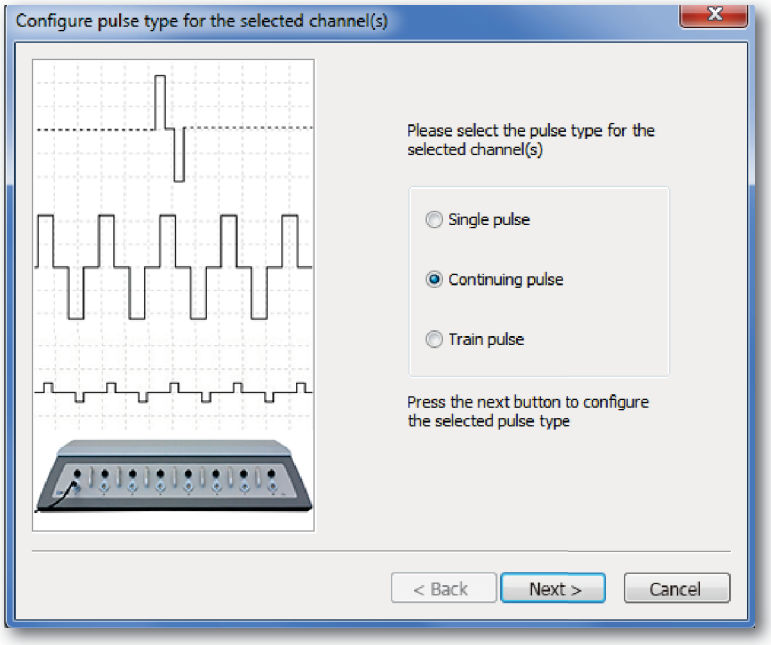


Figure 3.11 *Continuing Pulse stimulation protocol*

In the Continuing Pulse stimulation protocol the **Pulse shape** can be set to:

- **Bipolar:** First single stimulus will be positive and MyoPULSE will remember that the next Single pulse if repeated will be a negative voltage pulse.
- **Positive Monopolar:** Single positive voltage pulse.
- **Negative Monopolar:** Single negative voltage pulse.

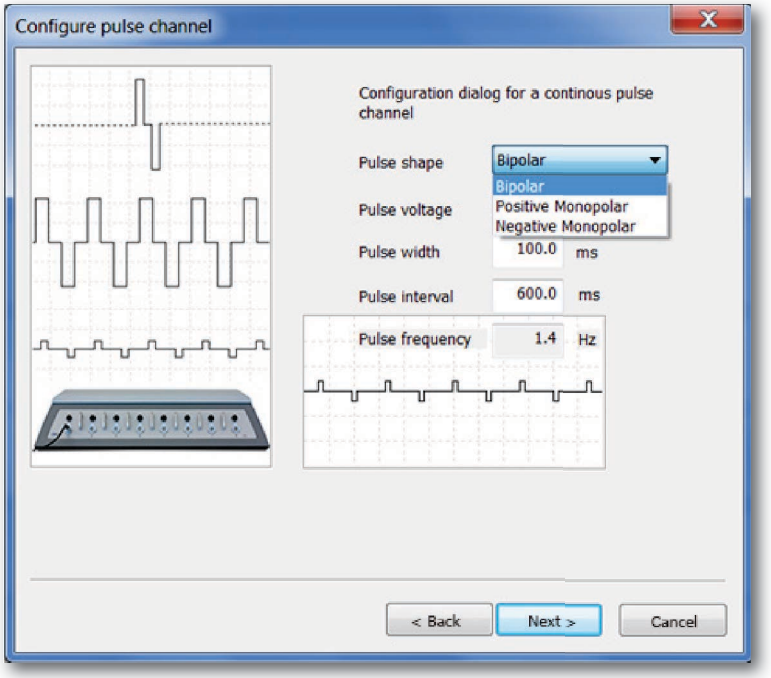


Figure 3.12 *Continuing pulse stimulation protocol - pulse shape*

Next set the **Pulse voltage** of the single pulse. In MyoPULSE the voltage can be set between 0-31 volt.

Next setting is the:
Pulse width in milliseconds (0.1msec-25msec).
Pulse Interval in milliseconds (0.1msec-25msec).
Pulse Frequecency – This cannot be set but is calculated based on the setting in Pulse width and Pulse interval.

After defining the **Pulse shape**, **Pulse voltage**, **Pulse width** and **Pulse interval** click **Next**.

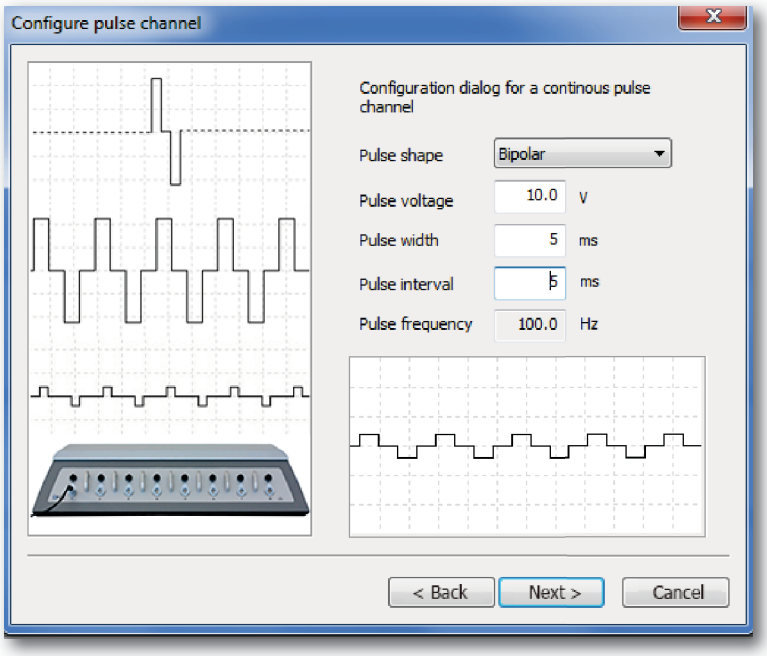


Figure 3.13 *Continuing pulse stimulation protocol - pulse settings*

The next window is the **Digital Input and Output** settings.

The Digital Input Settings is used to define when the stimulator should start the stimulation protocol. In MyoPULSE there is four different settings possible for starting the stimulation protocol.

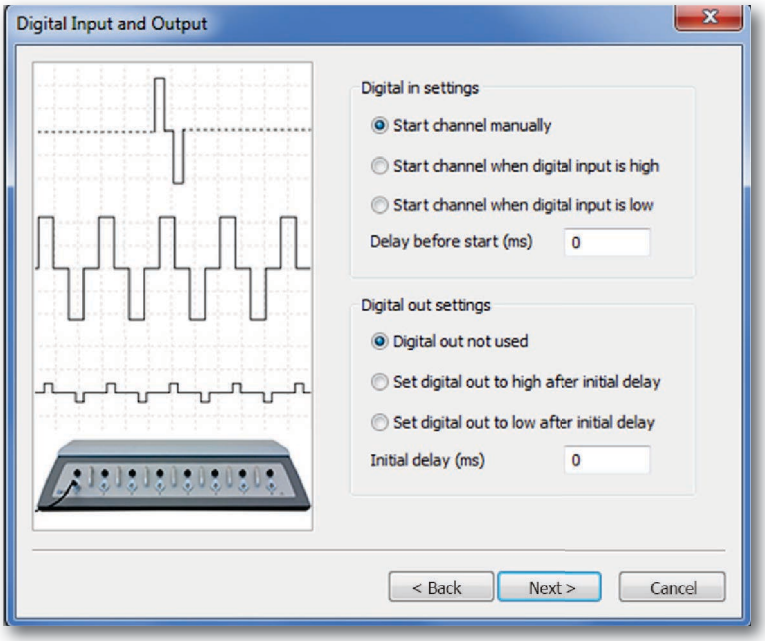


Figure 3.14 *Digital Input and Output settings*

1. **Start channel manually** – Use **Start all channels** in the **Control sub menu** in the **Home menu**. Alternative a specific channel can be started by clicking on the channel to highlight it.

Figure 3.15 *Highlighted channel*

Then click the **Play Button** in the Channel status window shown in figure 3.16 below.

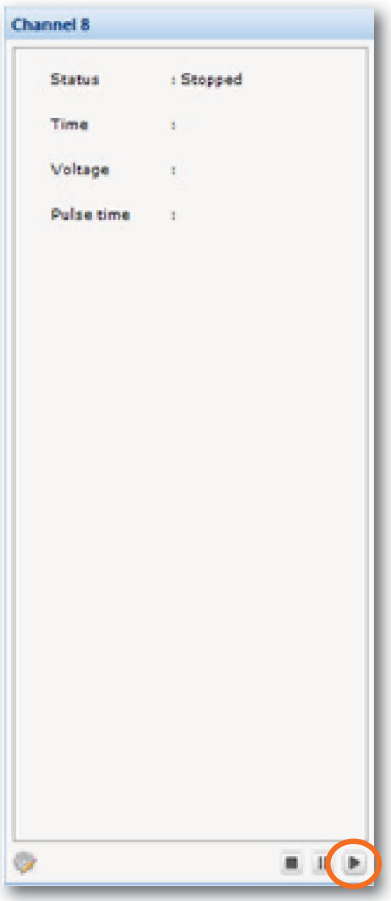


Figure 3.16 *Channel status window*

2. **Start when Digital input is high -** The CS8 stimulator will not start the stimulation protocol before a high voltage trigger input is received (between 6 and 24 volts).

3. **Start when Digital input is low** - The CS8 stimulator will not start the stimulation protocol before a low voltage trigger input is received (0 volts).

4. **Delay before start** - Enter the delay in milliseconds wanted before the stimulation protocol should start after the trigger was received.

The Digital Output Setting is used to send a trigger signal to an external unit e.g. the MyoDynamics Muscle Strip Myograph System - 840MD to trigger the start of the motors. In MyoPULSE there is four options available:

1. **Digital output not used** – No trigger will be send

2. **Set digital output to high after initial delay** – A high volt trigger will be send (6-24 volts) (used for the MyoDynamics Muscle Strip Myograph System - 840MD)

3. **Set digital output to low after initial delay** - A low volt trigger will be send (0 volts)

4. **Initial delay (ms)** – Enter the delay in milliseconds wanted before the trigger should be send. If a Digital Output trigger is chosen with a delay then enter the delay of interest in the Initial delay field in milliseconds.

After the setting of the Digital Input and Output click **Next**.

The last window in the Single Pulse configuration is showing the settings selected by the user as a summary (see figure 3.17 below) showing the:

- Pulse Type
- Pulse shape
- Pulse width
- Pulse Interval
- Frequency (calculated)
- Voltage
- Total running time (calculated)

Click **Finish** to save the stimulation protocol and transfer it to all the channels of the stimulator.

NOTE
IT IS VERY IMPORTANT THAT YOU CLICK ON THE FINISH BUTTON OTHERWISE THE PROTOCOL WILL NOT BE TRANSFERRED TO THE STIMULATOR.

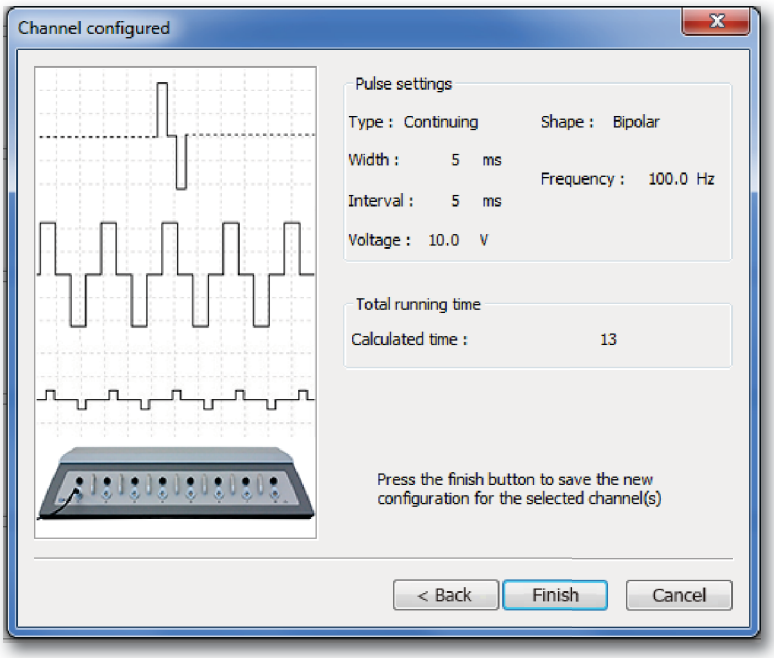


Figure 3.17 *Continuing pulse stimulation protocol summary*

3.2.3 Train Pulse stimulation protocol

In the Train Pulse stimulation protocol the **Pulse shape** can be set to:

- **Bipolar:** First single stimulus will be positive and MyoPULSE will remember that the next Single pulse if repeated will be a negative voltage pulse.
- **Positive Monopolar:** Single positive voltage pulse.
- **Negative Monopolar:** Single negative voltage pulse.

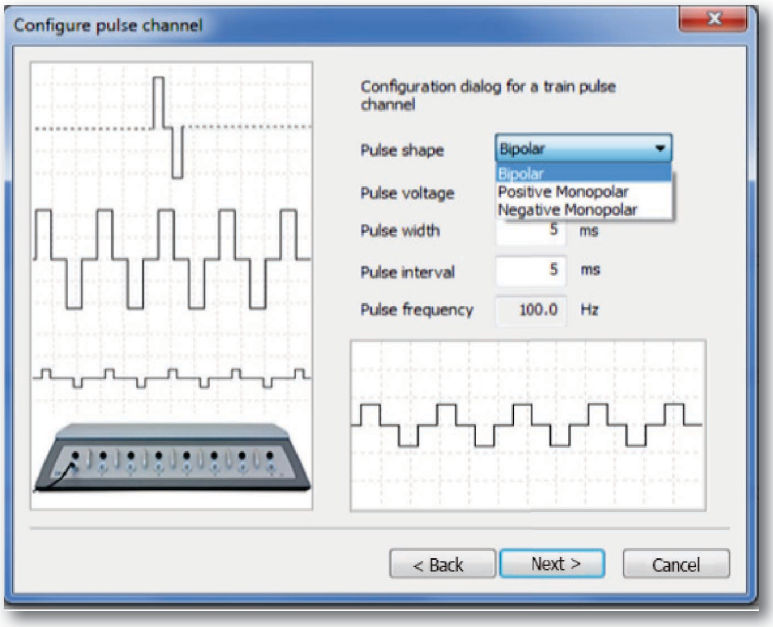


Figure 3.18 *Train Pulse stimulation protocol - Pulse shape*

Next set the **Pulse voltage** of the single pulse. In MyoPULSE the voltage can be set between 0-31 volt.

Next settings are the:
Pulse width in milliseconds (0.1msec-25msec).
Pulse Interval in milliseconds (0.1msec-25msec).
Pulse Frequecency – This cannot be set but is calculated based on the setting in Pulse width and Pulse interval.

After defining the **Pulse shape**, **Pulse voltage**, **Pulse width** and **Pulse interval** click **Next**.

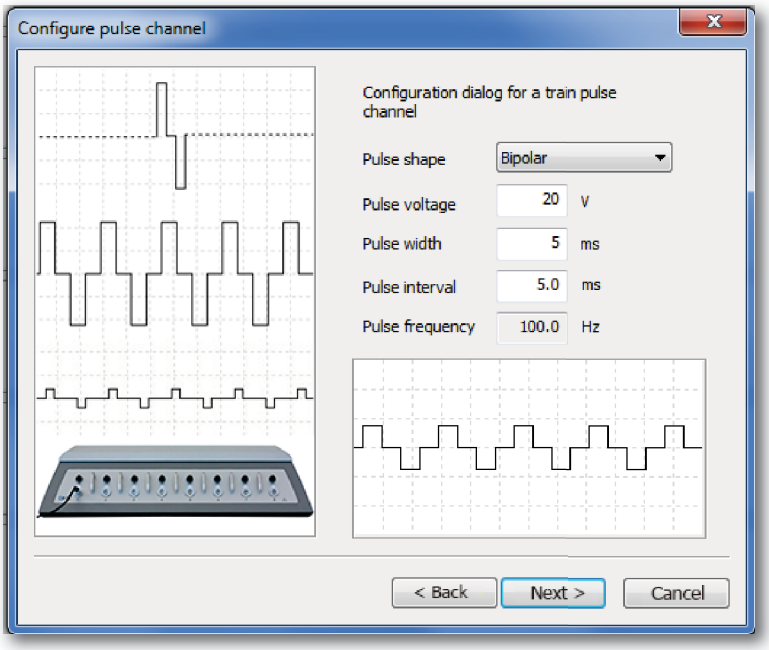


Figure 3.19 *Train Pulse stimulation protocol - Configure pulse settings*

The next window is the settings of the parameters for configuring **Train Pulses** and **Train Groups**.

Configuring Train Pulses:

Pulse count in each train – Enter number of pulses wanted in a train.
OR
Total Train time (ms) – Enter how long a train should last in milliseconds.

NOTE
SELECT EITHER PULSE COUNT IN EACH TRAIN OR TOTAL TRAIN TIME. DEPENDING OF WHAT IS CHOSEN THE OTHER PARAMETER WILL CHANGE ACCORDING TO THE ENTERED VALUE.

In the figure 3.20 below the Pulse count in each train is set to 20 and then Total Train time is calculated to 200ms. In figure 3.21 the Total Train time is changed to 100ms and then automatically the Pulse count in each train is altered to 10.

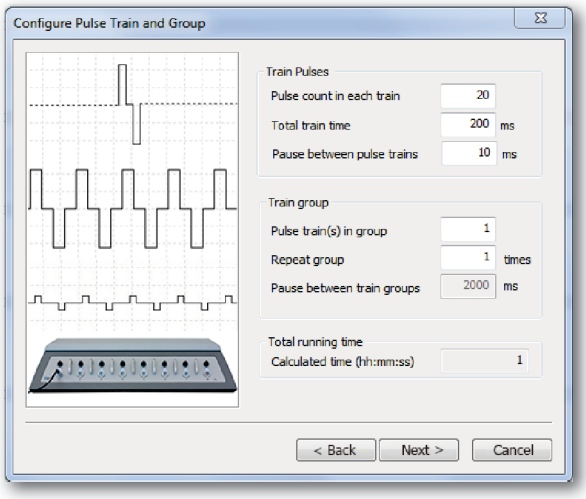


Figure 3.20 *Configuring Train Pulses*

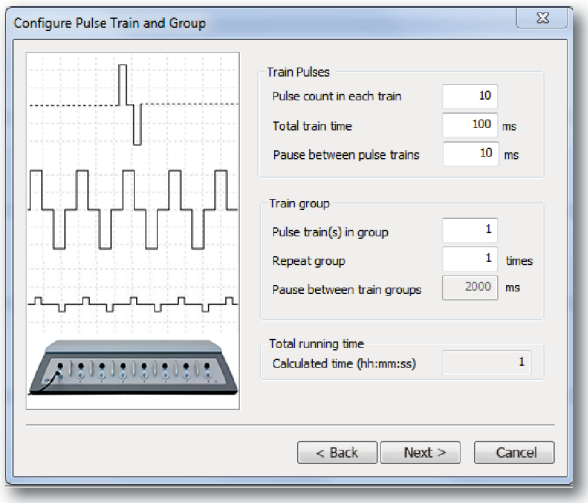


Figure 3.21 *Configuring Train Pulses*

Configuring Train Group:

Pulse train(s) in group – Enter number of trains in one group.
Repeat group – Enter how many times a group should be repeated.
Pause between train groups – Enter the pause time in milliseconds between the groups.

Based on all the entered values MyoPULSE calculate the **Total running time** shown in the format hh:mm:ss shown in the **Calculated time** (hh:mm:ss) field, see figure 3.22 below.

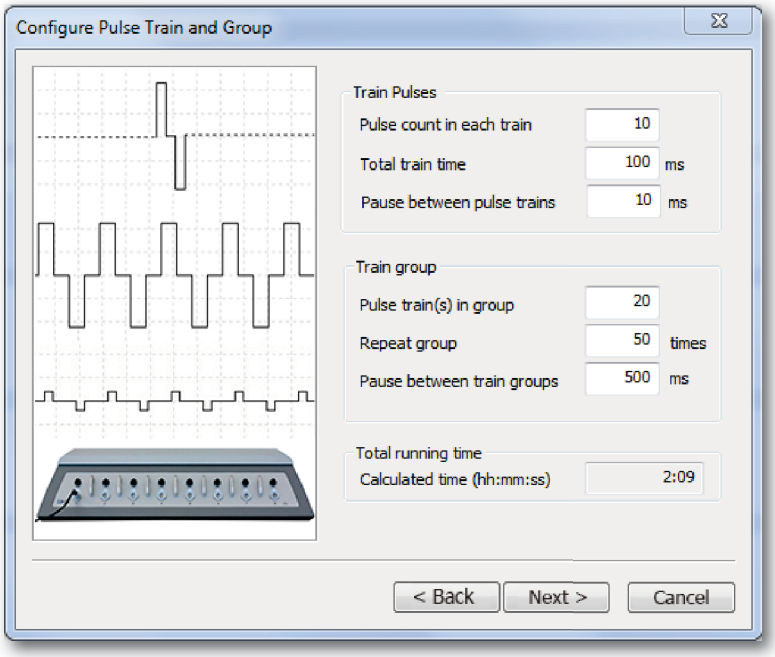


Figure 3.22 *Configuring Train Group*

Click **Next** will open the **Set increasing or decreasing values menu**.

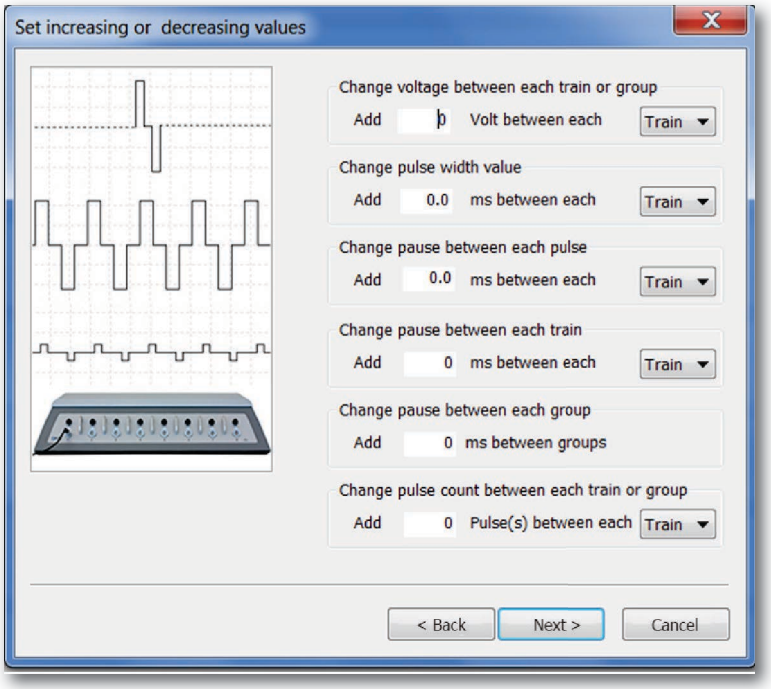


Figure 3.23 *Set increasing or decreasing values menu*

Change voltage between each train or group – Enter the voltage to be added e.g. 0.1 or decreased e.g. - 0.1 after each train or group by selecting the Train or Group option in the dropdown menu to the right (see figure 3.24 below).

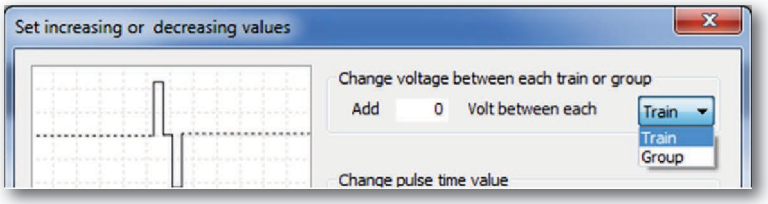


Figure 3.24 *Train or Group option*

Change pulse time value – Enter the time in milliseconds the Pulse width should be increased (e.g. 0.1) or decreased (e.g. -0.1) after each train or group by selecting the Train or Group option in the dropdown menu to the right.

Change pause between each pulse – Enter the time in milliseconds the Pause between the pulses should be increased or decreased after each train or Group by selecting the Train or Group option in the dropdown menu to the right.

Change pause between each train – Enter the time in milliseconds the Pause between each Train should be increased or decreased after either each train or group by selecting the Train or Group option in the dropdown menu to the right.

Change pause between each Group – Enter the time in milliseconds the Pause between each Group should be increased or decreased after each group.

Change pulse count between each train or group – Enter the number of pulses to be increased or decreased to each train after either each train or group by selecting the Train or Group option in the dropdown menu to the right.

See example in figure 3.25.

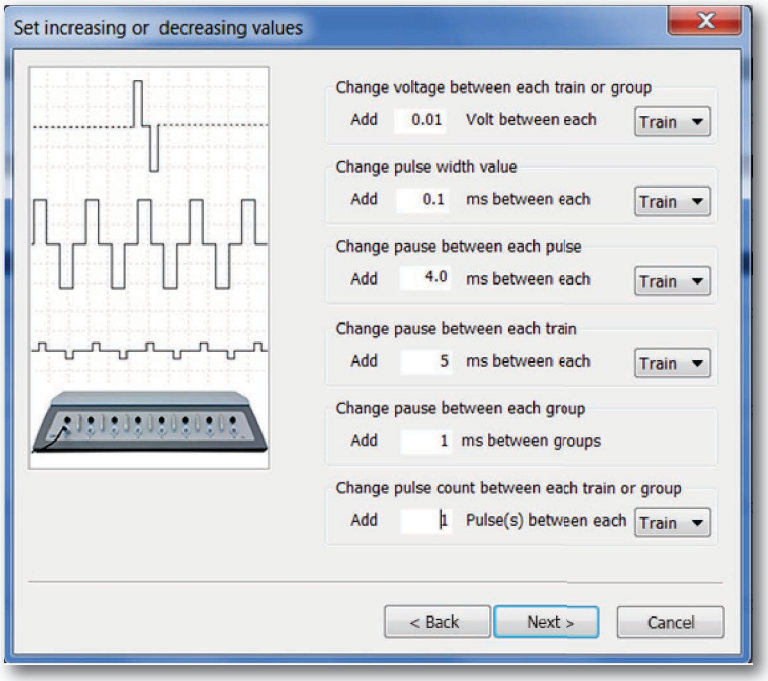


Figure 3.25 *Set increasing or decreasing values - example*

Click **Next**.

The next window is the **Digital Input and Output Settings**.

The Digital Input Settings is used to define when the stimulator should start the stimulation protocol. In MyoPULSE there is four different settings possible for starting the stimulation protocol.

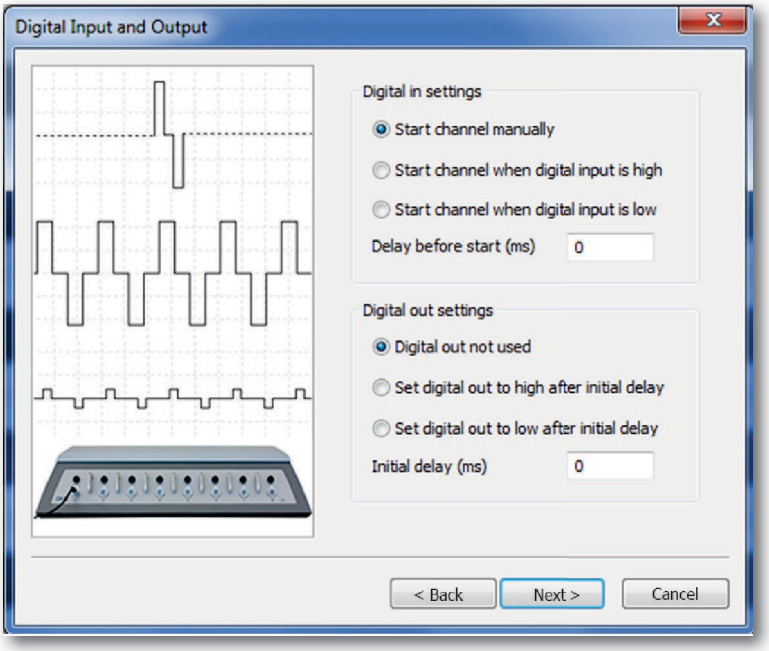


Figure 3.26 *Digital Input and Output window*

1. **Start channel manually** – Use the **Start all channels** in the **Control sub menu** in the **Home menu**. Alternative a specific channel can be started by clicking on the channel to highlight it.

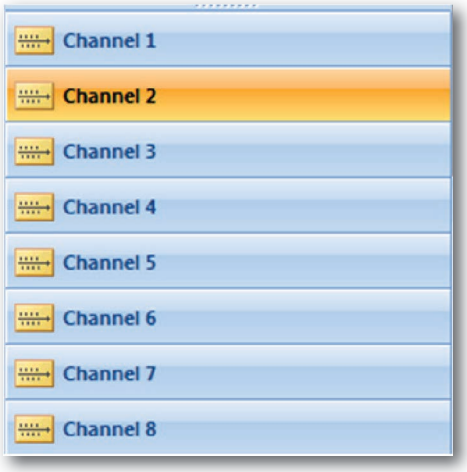


Figure 3.27 *Highlighted channel*

Then click the **Play Button** in the Channel status window shown in figure 3.28 below.

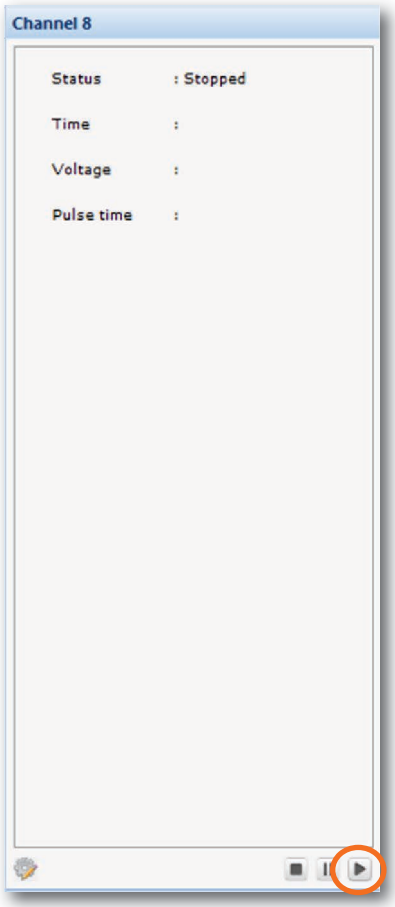


Figure 3.28 *Channel status window*

2. **Start when Digital input is high** - The CS4 and CS8 stimulator will not start the stimulation protocol before a high voltage trigger input is received (between 6 and 24 volts).

3. **Start when Digital input is low** - The CS4 and CS8 stimulator will not start the stimulation protocol before a low voltage trigger input is received (0 volts).

4. **Delay before start** - Enter the delay in milliseconds wanted before the stimulation protocol should start after the trigger was received.

The **Digital Output Setting** is used to send a trigger signal to an external unit e.g. the MyoDynamics Muscle Strip Myograph System - 840MD to trigger the start of the motors. In MyoPULSE there is four options available:

1. **Digital output not used** - No trigger will be send.

2. **Set digital output to high after initial delay** - A high volt trigger will be send (6-24 volts).

3. **Set digital output to low after initial delay** - A low volt trigger will be send (0 volts).

4. **Initial delay (ms)** – Enter the delay in milliseconds wanted before the trigger should be send. If a Digital Output trigger is chosen with a delay then enter the delay of interest in the Initial delay field in milisecounds.

After the setting of the Digital Input and Output click **Next**.

The last window in the Train Pulse configuration is showing the setting selected by the user as a summary (see figure 3.29 below) showing the:

- Pulse Type
- Pulse shape
- Pulse width
- Pulse Interval
- Frequency (calculated)
- Voltage
- Total running time (calculated)

Click **Finish** to save the stimulation protocol and transfer it to all the channels of the stimulator. A graphic overview of the Stimulation protocol will be shown (see figure 3.30).

NOTE
IT IS VERY IMPORTANT THAT YOU CLICK ON THE FINISH BUTTON OTHERWISE THE PROTOCOL WILL NOT BE TRANSFERRED TO THE STIMULATOR.

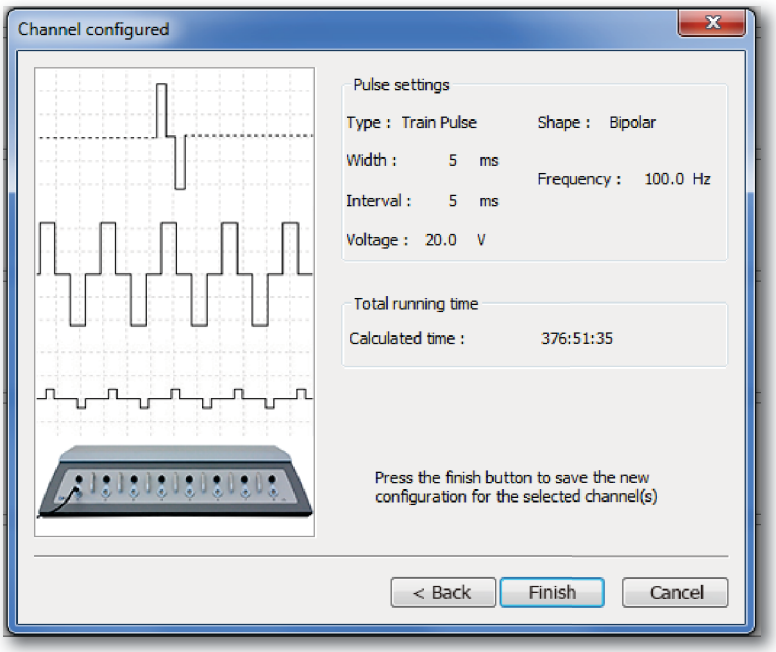


Figure 3.29 *Train Pulse stimulation protocol summary*

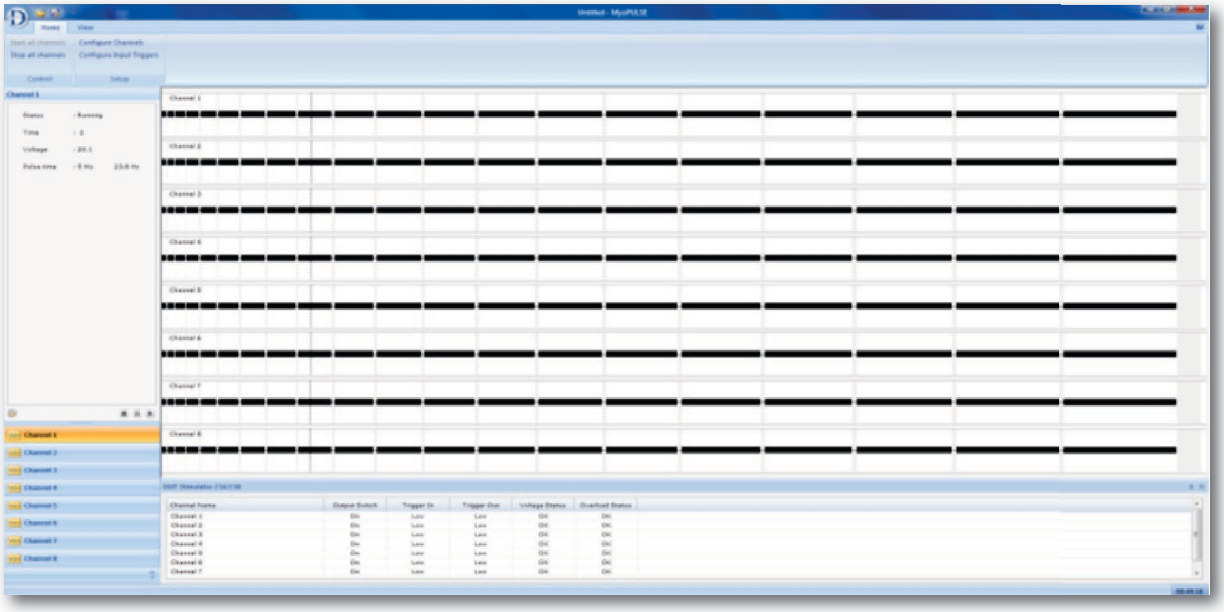


Figure 3.30 *Overview of the Stimulation protocol*

3.3 Start a Stimulation Protocol

The CS4 and CS8 stimulator have on the front ON/OFF Output switches for each channel.

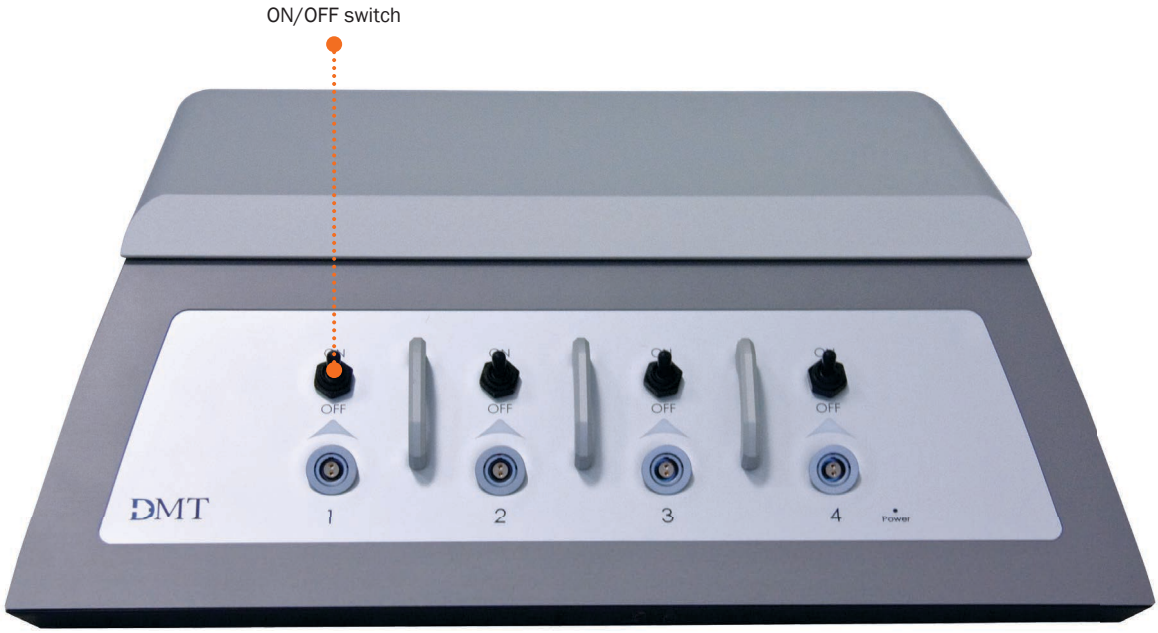


Figure 3.31 *Stimulator CS4 - ON/OFF Output switch*

If an Output switch is in the OFF position it is not possible to start a stimulation protocol for the given channel. Therefore it is very important that the user turn the appropriate/right switches in the ON position before starting a stimulation protocol. In the status window the status of the Output switch is shown (see in figure 3.32 below).

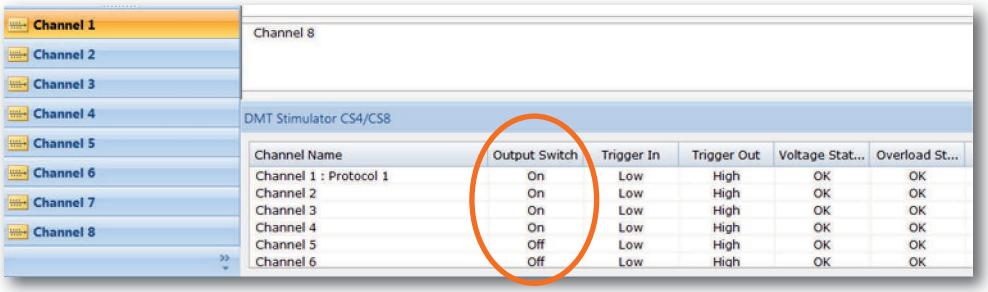


Figure 3.32 *CS4/CS8 Stimulator status - Output switch*

Before the CS4 and CS8 stimulator can start a stimulation protocol you have to either:

1. Make a stimulation protocol for all channels using the **Configure all channels** in the **Setup sub menu** in the **Home menu**.

OR

2. Make a stimulation protocol for a single specific channel by right clicking on the given channel and select **Settings** (see figure 3.33 below) and go through the stimulation protocol guide (see chapter 3.2).

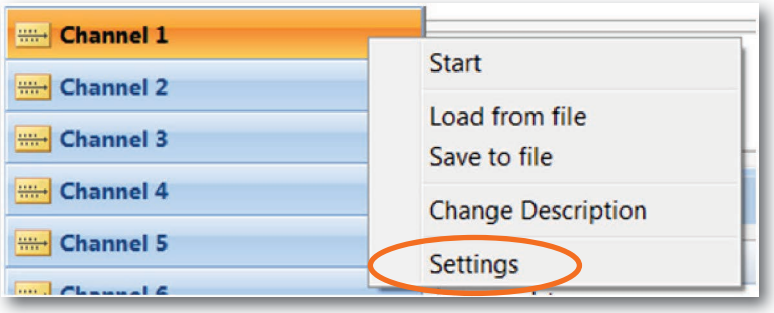


Figure 3.33 *Right clicking on channel 1*

OR

3. Load a Stimulation Protocol for all channels by clicking **Open** in the top left corner/application button.

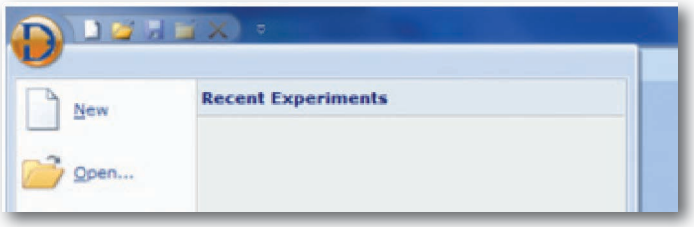


Figure 3.34 *Open*

OR

4. Load a Stimulation protocol for only one specific channel by right clicking on the given channel and select **Load from file** (see figure 3.35 below) and select the appropriate file.

NOTE
A STIMULATION FILE MADE FOR ALL EIGHT CHANNELS CANNOT BE LOADED INTO A SINGLE CHANNEL AND VISA VERSA.

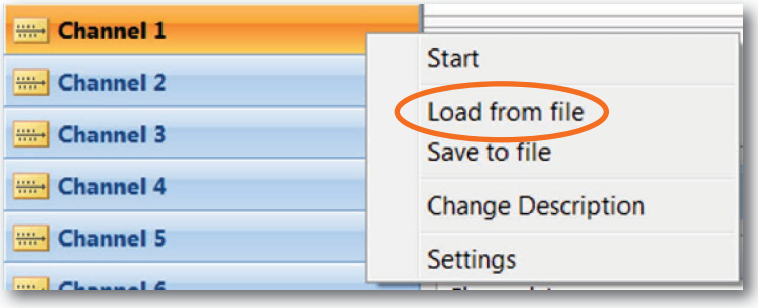


Figure 3.35 *Right clicking on channel 1*

After a stimulation protocol have been loaded or made for the channels (It is possible to have different protocols for each channel) the stimulation protocols can be started pressing either:

1. **Start all channels** in the **Control sub menu**. This will start the stimulation protocols of all channels simultaneously running the Stimulation protocol loaded/made for each channel.

OR

2. Start a stimulation protocol for only one specific channel by selecting e.g. channel 2, as shown in figure 3.36 below.

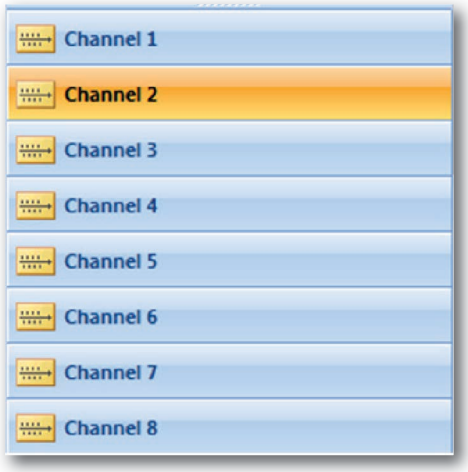


Figure 3.36 *Selecting channel 2*

- followed by clicking on the small **Play button** in the Channel status window as shown in figure 3.37 below.

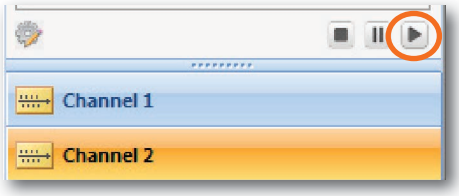


Figure 3.37 *Play button*

This will only start the stimulation protocol for Channel 2 as shown in figure 3.38 below.

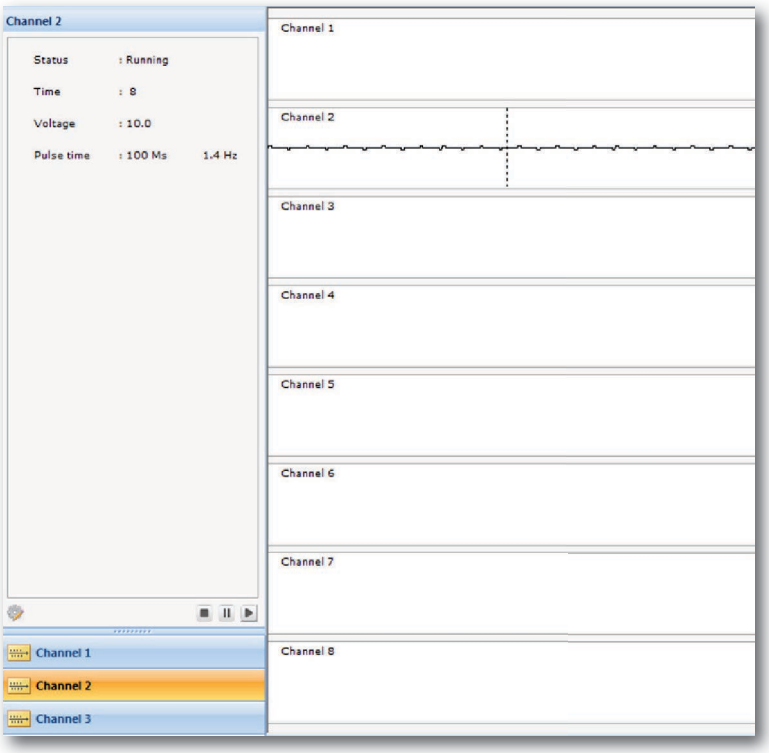


Figure 3.38 *Stimulation protocol for channel 2*

NOTE
REMEMBER TO PUT THE APPROPRIATE CHANNEL OUTPUT SWITCHES TO THE ON POSITION BEFORE STARTING A STIMULATION PROTOCOL.

3.4 Saving Stimulation Protocols

After the stimulation protocol for a single channel or various channels have been made the protocols can be saved and opened in two ways.

1. By selecting **Save as**: the protocols loaded/made for all channels will be saved into a single file where the protocols for each channel can be identical or completely different. By selecting **Open** an existing saved stimulation protocol file containing the Stimulation protocols for all channels can be loaded.

OR

2. A protocol made for a single channel can be saved and loaded into another channel. After a protocol has been made for a channel it can be saved by right clicking on the given channel and selecting **Save to file**. This single channel stimulation protocol file can then be loaded into any other channel by right clicking on the given channel and select **Load from file**.

The possibility to save a single channel protocol and saving a file containing all channel protocols makes it fast and easy to make a lot of different protocols, one for each channel and finally save these into a single file.

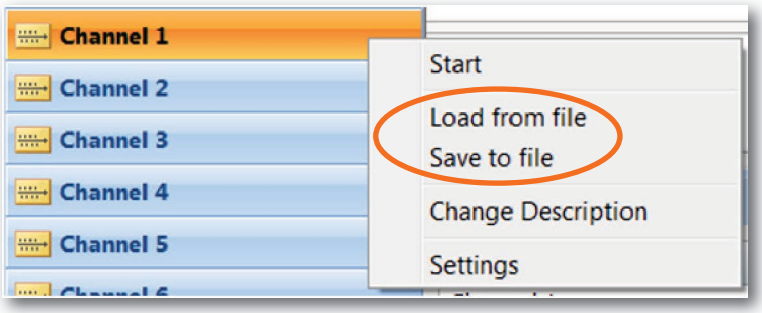


Figure 3.39 *Right clicking on a given channel*

3.5 Input Trigger

The CS4 and CS8 have an input trigger feature making it possible to trigger and start a stimulation protocol from e.g. a MyoDynamics Muscle Strip Myograph System - 840MD or Powerlab. All the channels on the CS4 and CS8 stimulator can be controlled individually or in groups using the individual Input Trigger ports on the back panel of the CS4 and CS8 stimulators. On the back panel of the CS4 and CS8 there is two types of plugs, a four pin and a three pin plug. The four pin plugs are Input Trigger port and the three pin plugs are output trigger ports (see figure 3.40).

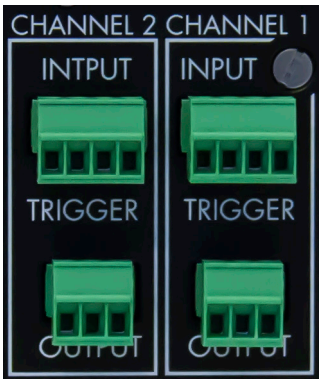


Figure 3.40 *Input and Output Trigger - Back panel of CS4*

The MyoDynamics Muscle Strip Myograph System - 840MD is provided with cables fitting to the Input and Output Trigger ports of the CS4 and CS8 stimulator making it impossible to connect the stimulator and the MyoDynamics Muscle Strip Myograph System - 840MD in a wrong way.

The CS4 and CS8 need a trigger Input of +5V to +24V (unit protected from damage for input signals to +30 volts) to initiate a Trigger function defined in the Stimulation Protocol setup as shown below where the Digital in setting have been selected to start when the Input is high ("Start channel when digital input is high").

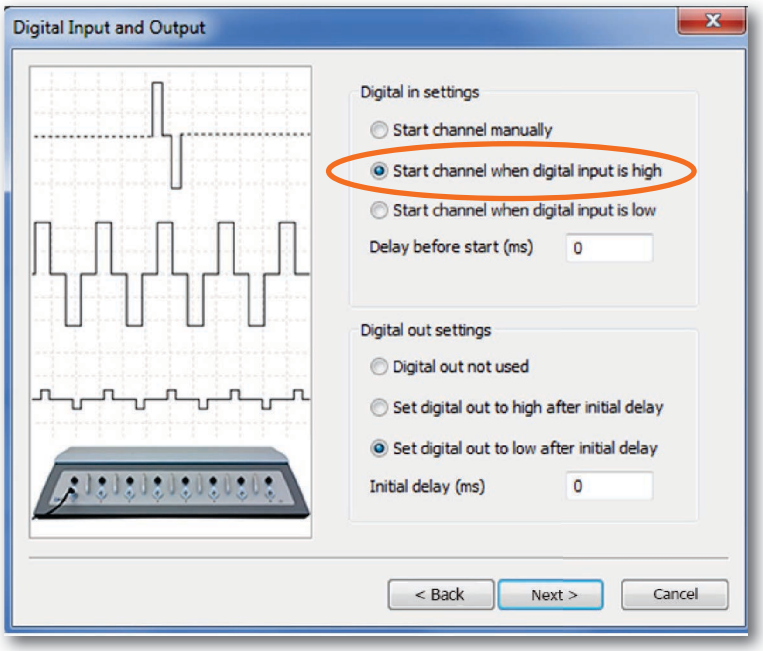


Figure 3.41 *Trigger function defined in the Stimulation Protocol setup*

In the **Setup sub menu** of MyoPULSE the Input Triggers can be set to define a Master Input trigger.

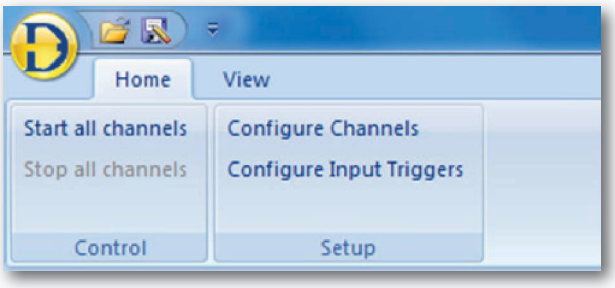


Figure 3.42 *Setup submenu - Configure Input Triggers*

For the CS4 stimulator there is one Master Trigger placed on Channel 1 controlling the trigger in channel 2, 3 and 4.

The CS8 stimulator has two Master Triggers one at Channel 1 able to control channel 2, 3 and 4 and a Master Trigger at Channel 5 controlling the trigger at channel 6, 7 and 8.

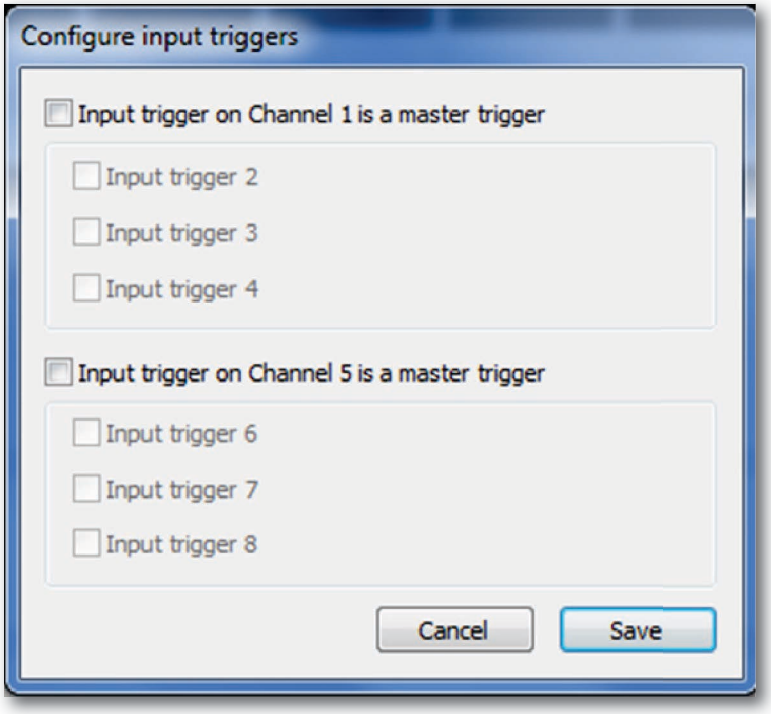


Figure 3.43 *Configure input triggers*

By selecting e.g Channel 1 as an input trigger it is possible to select the channels that should be controlled by the Master Trigger in Channel 1. In figure 3.44 below the Master Trigger has been selected to be Channel 1 and by selecting Input trigger 3 the Input trigger received in Channel 1 (Master Trigger) will also trigger channel 3 but not channel 2 and 4.

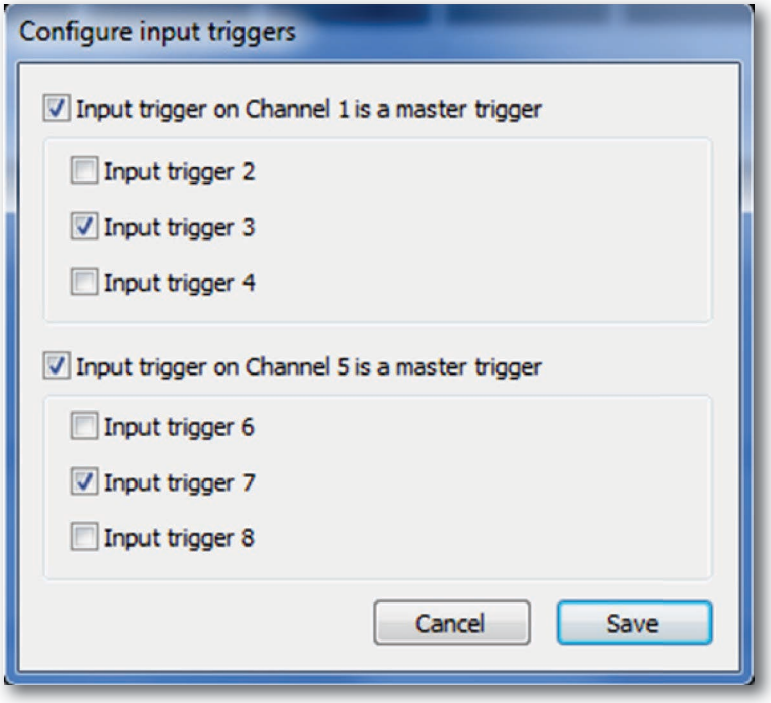


Figure 3.44 *Configure input triggers*

APPENDIX 1 - TRIGGER IN- AND OUTPUT

Trigger Input specifications

Pulse Trigger Input: +5V to +24V (unit protected from damage for input signals to +30 volts).

Trigger Input Connector: Rear panel

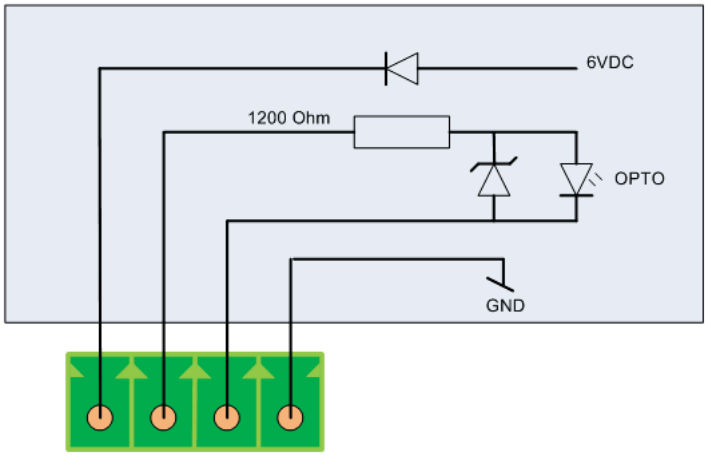


Figure A1.1 *INPUT connecter, rear panel*

Trigger Output

Pulse Trigger Output: Transistor Open collector max. +24V (unit protected from damage for signals to +30 volts).

Trigger Output Connector: Rear panel

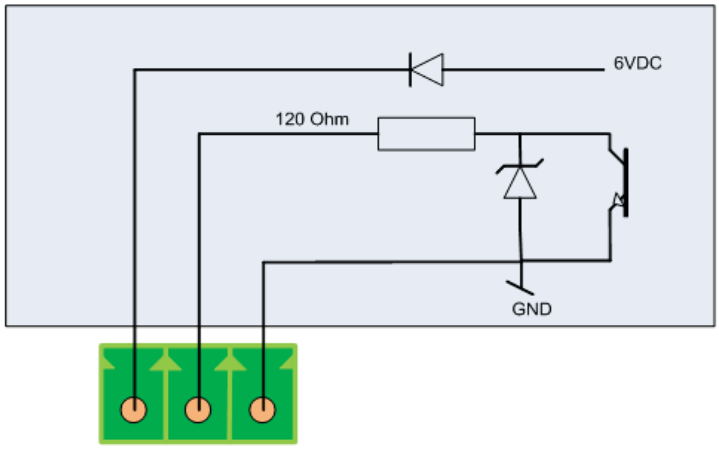


Figure A1.2 *OUTPUT connecter, rear panel*

APPENDIX 2 - UPGRADING

MyoPULSE upgrades is free within the same version number e.g. if version 1.0 has been purchased all upgrades up to version 1.9.9 will be free of charge. When DMT release a new version number a complete new installation of the MyoPULSE version will be performed.

In MyoPULSE in the right corner a question mark icon is shown. Clicking this icon will open the **About MyoPULSE** as seen below. Here the license version installed can bee seen.

Figure A2.1 *About MyoPULSE*

APPENDIX 3 - SYSTEM SPECIFICATIONS

Technical specifications

Output voltage:	0-31 volt
Output:	Mono/Bipolar
Stimulus width:	0.1 -25 msec.
Max frequency:	2500Hz
Number of Pulse in one train:	1-32000
Number of Trains in one group:	1-32000
Number of Group:	1-32000
Trigger pulse delay:	0-3600 sec.
Voltage supply:	100-240 volt 50/60 Hz to 48 volt DC 70 watt Power adapter.

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